

Fig. 1
Surface modification scheme

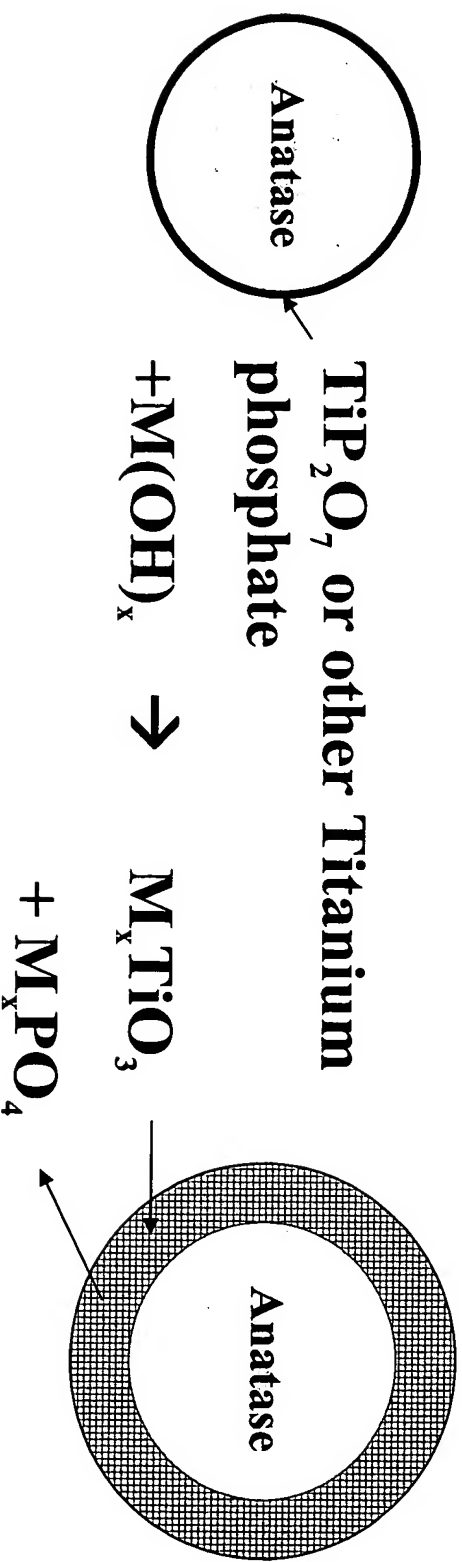


Fig. 2

Surface modification step 1 - Creating a titanate layer on an anatase nanoparticle in an aqueous slurry. M is an alkali metal.

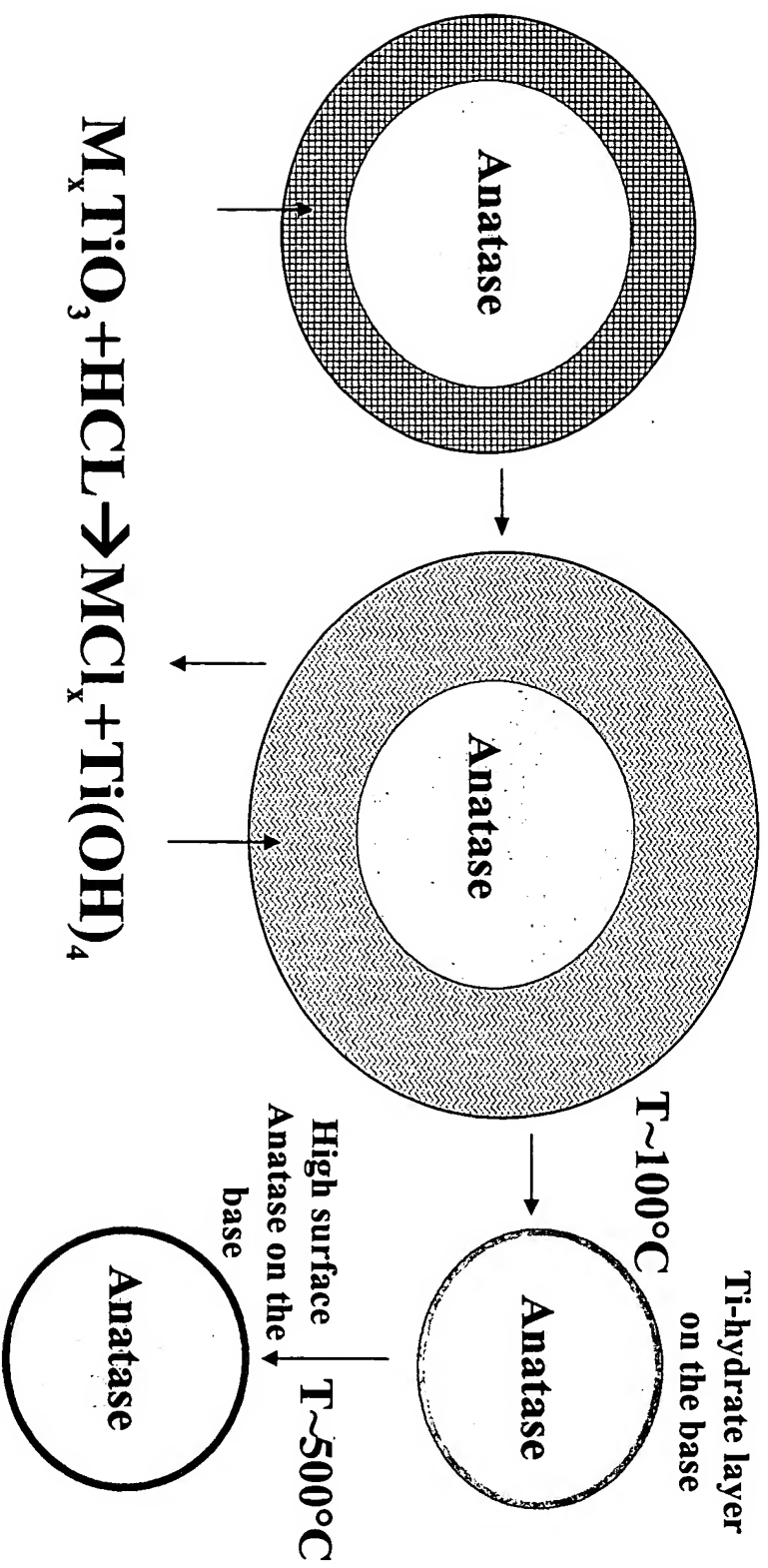
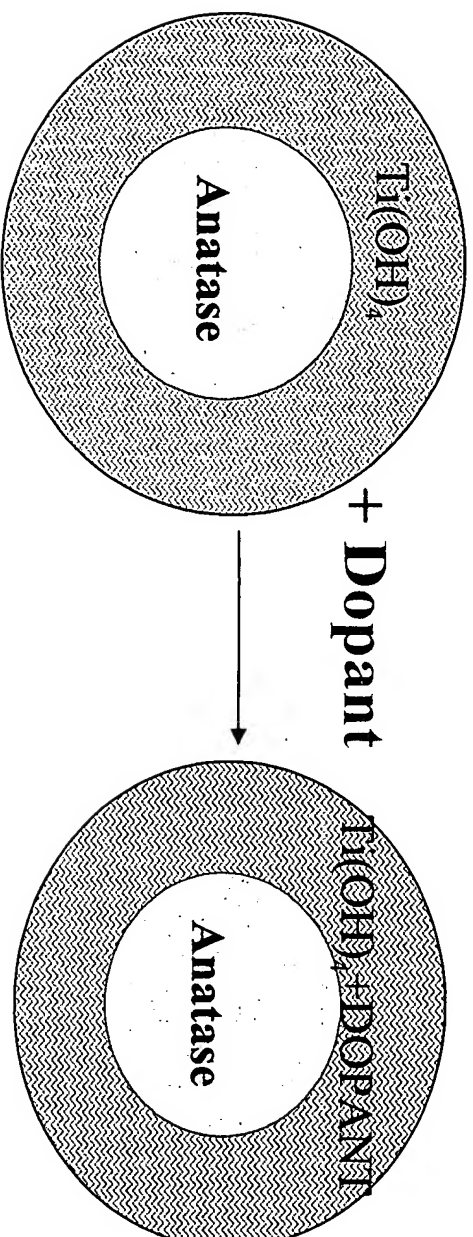


Fig. 3

Surface modification step 2: Conversion of the alkali metal titanate layer into a Ti-hydrate gel layer and further calcining



Examples of dopants:

- a) Inorganic salts
- b) Colloidal metals or complexes
- c) Water soluble organic compounds

Fig. 4

Doping of the gel layer on the base.

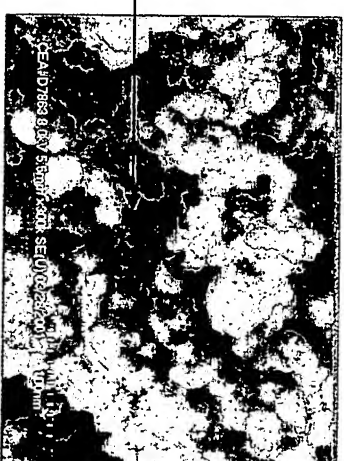
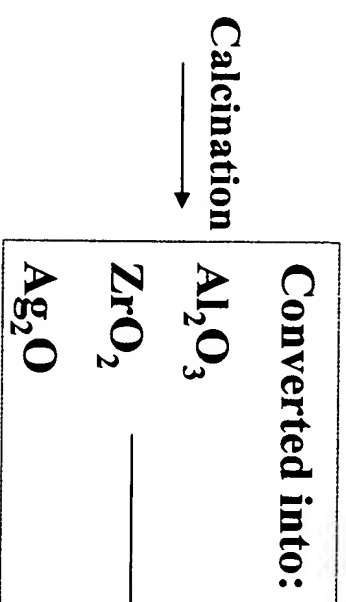
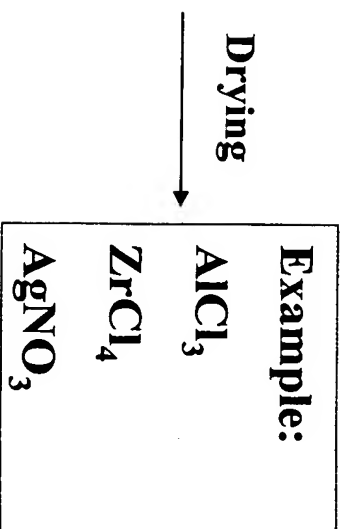
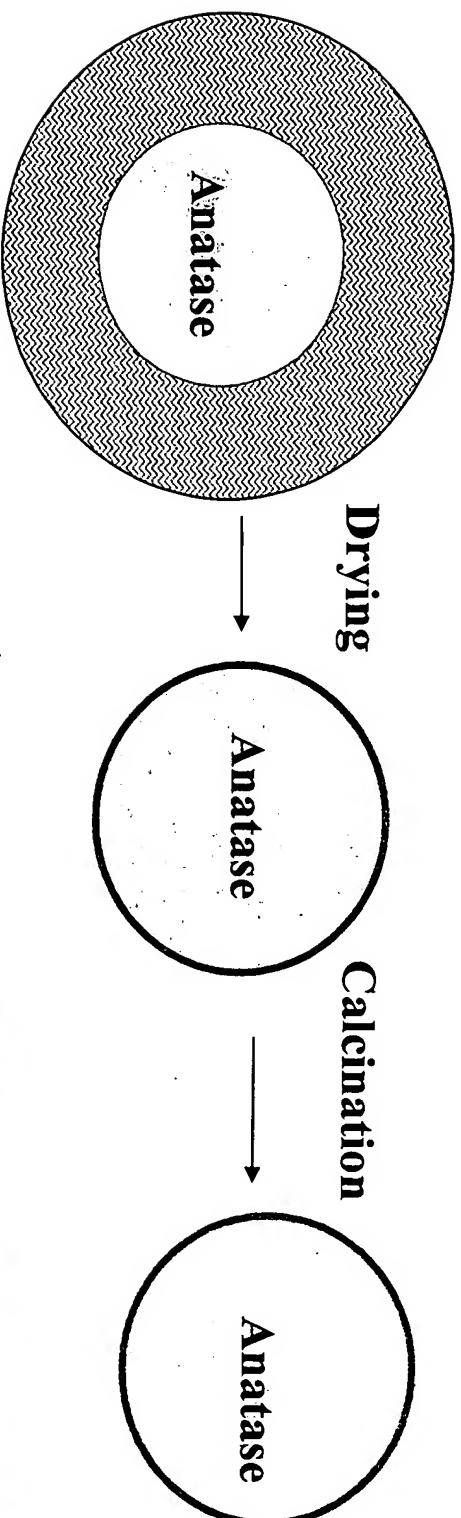


Fig. 5a

Fig. 5b

Drying of the doped material and conversion of the dopant in a calcination step

Fig. 6

CEA#D4517.3.0kV.4.6mm x200k SE(U)

200nm

Fig. 6c

CEA#D4517.3.0kV.4.6mm x200k SE(U)

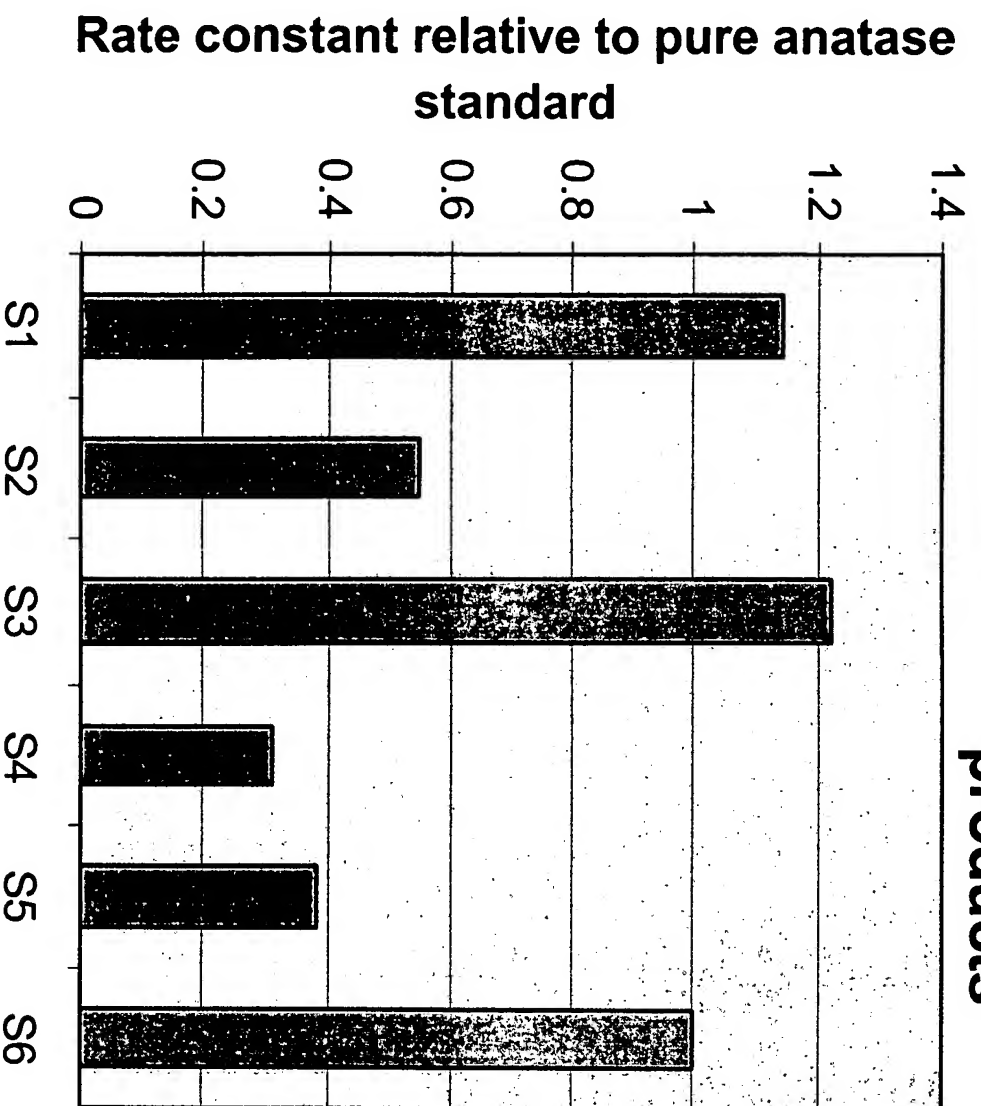
200nm

CEA#D4517.3.0kV.5.3mm x100k SE(U)

500nm

10 — 100 nm
mm

FIG. 7: Rate constants for the photochemical degradation of 4-CP on several surface-modified products



S1: Nanoanatase base
(with phosphate treatment)
S2: Titanium hydrate
S3: SnO₂ surface modification
S4: BaSO₄ surface modification
S5: BaTiO₃ surface modification
S6: Pure nano-anatase standard
(without phosphate treatment)

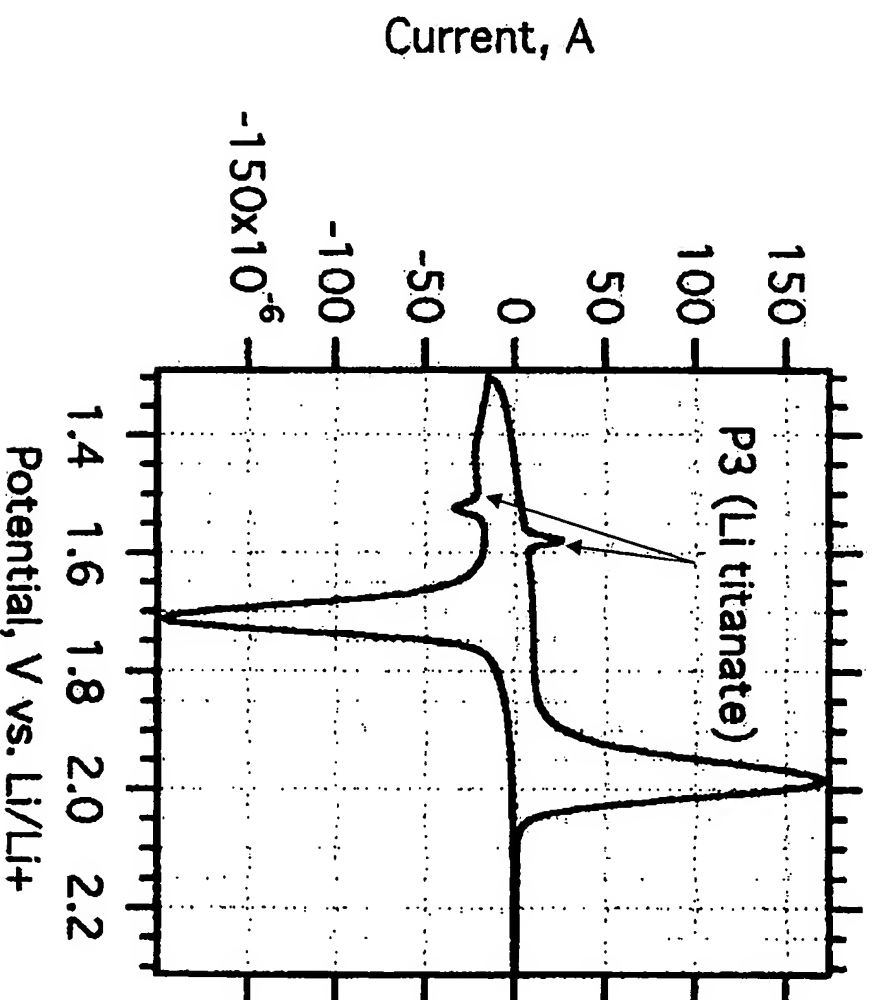
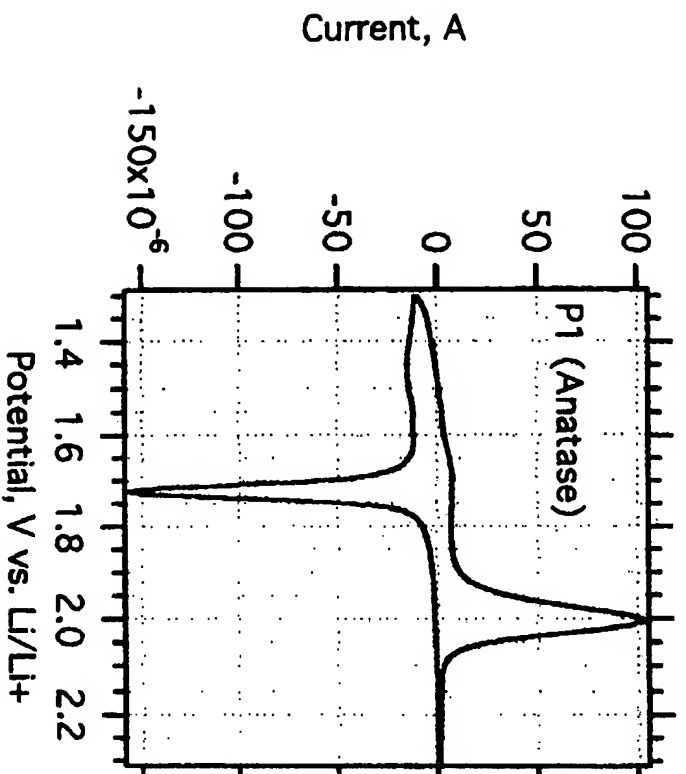


Fig. 8a

Electrochemical characterization of the surface composition using cyclic voltammetry. Lithium titanate surface modification with a significant electrochemical response.

Fig. 8b

Li-insertion test
1M Li(CF₃SO₂)₂ + EC/DME
CV - 0.1 mV/s

Li-insertion test; 1-M Li(CF₃SO₂)₂; CV - 0.1 mV

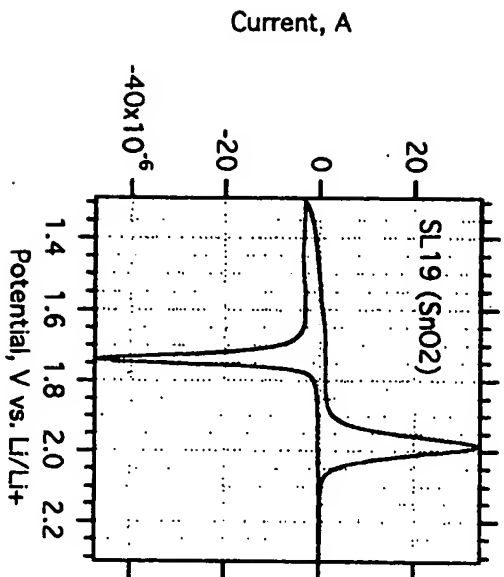


Fig. 9a

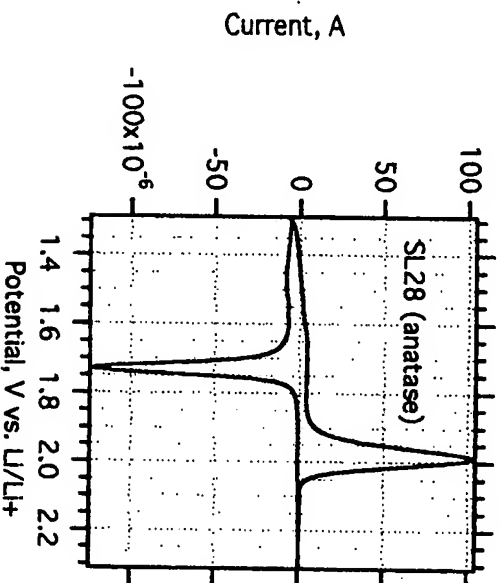


Fig. 9b

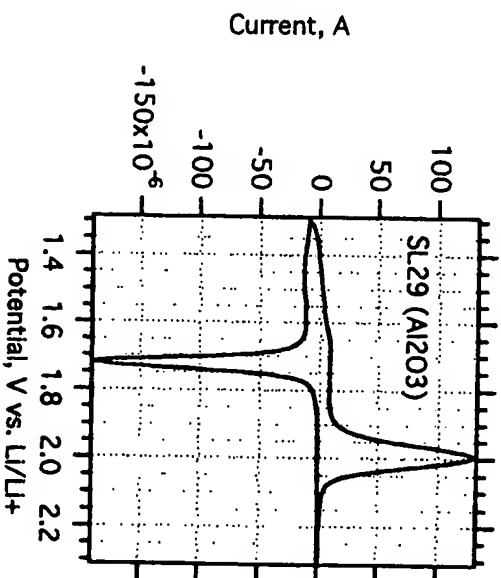


Fig. 9c

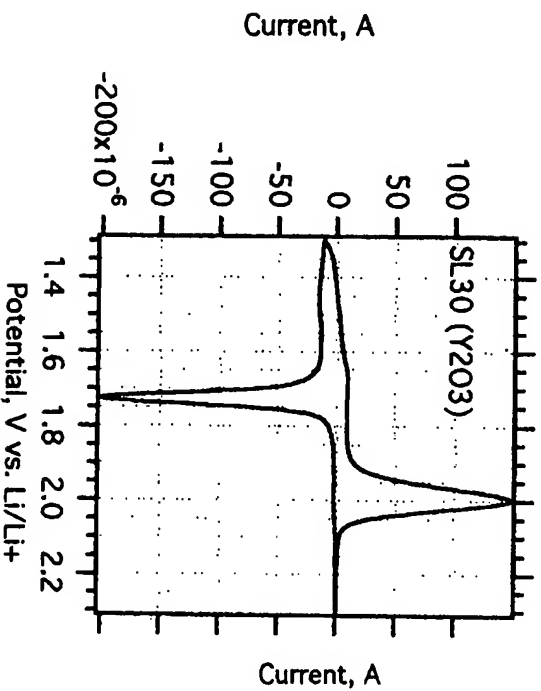


Fig. 9d

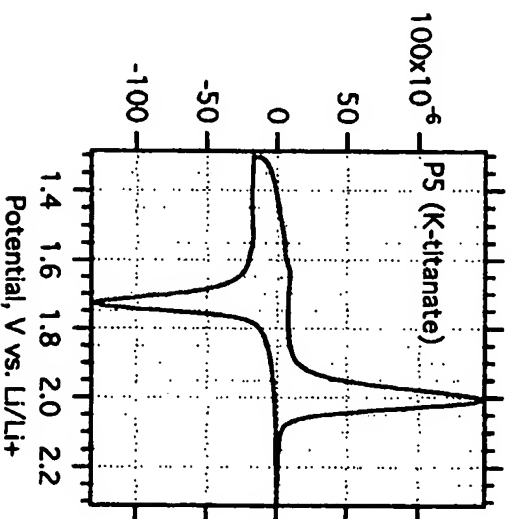


Fig. 9e

Fig. 9
Electrochemical
characterization using
cyclic voltammetry.
Surface modifications with
no significant
electrochemical response.

Fig. 10a

Photochemical
measurement of the
calcined nanoanatase
base material for surface
modifications

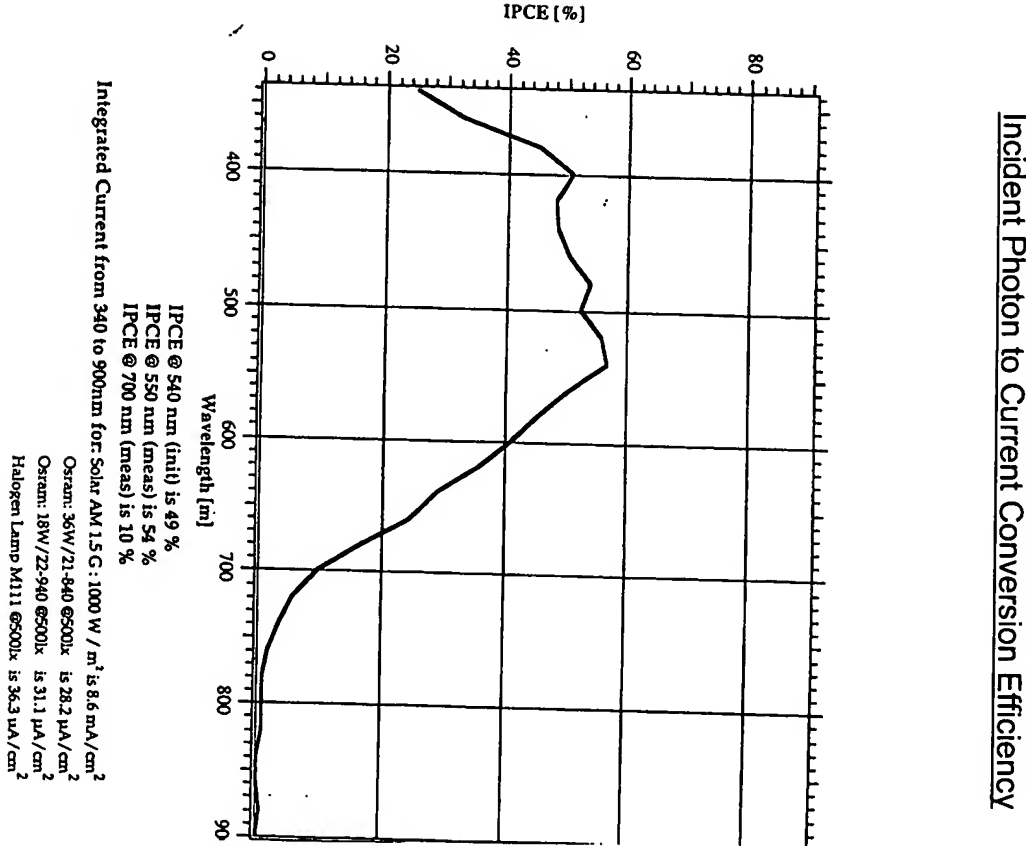


Fig. 10b

**Photochemical
measurement of
lithium titanate
modified surface**

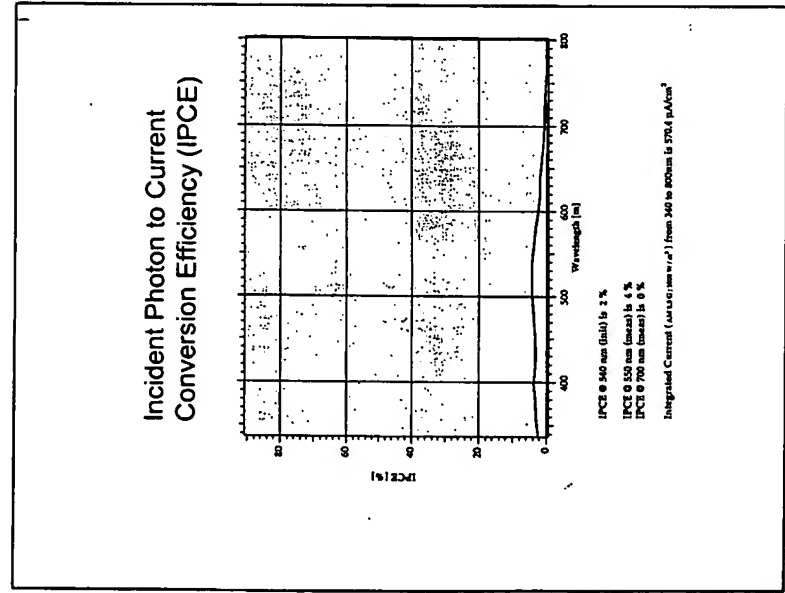


Fig. 10c

**Photochemical
measurement of
potassium titanate
modified surface**

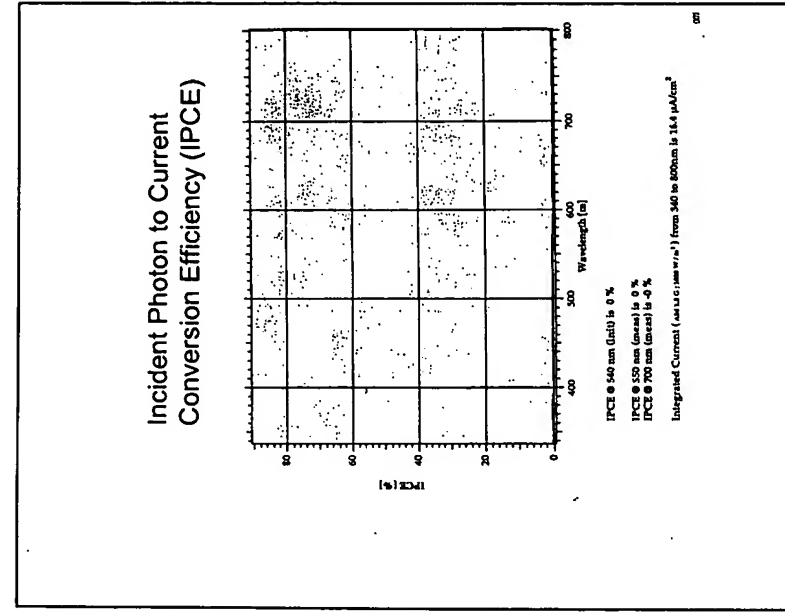


Fig. 10d

**Photochemical
measurement of tin
oxide modified surface**

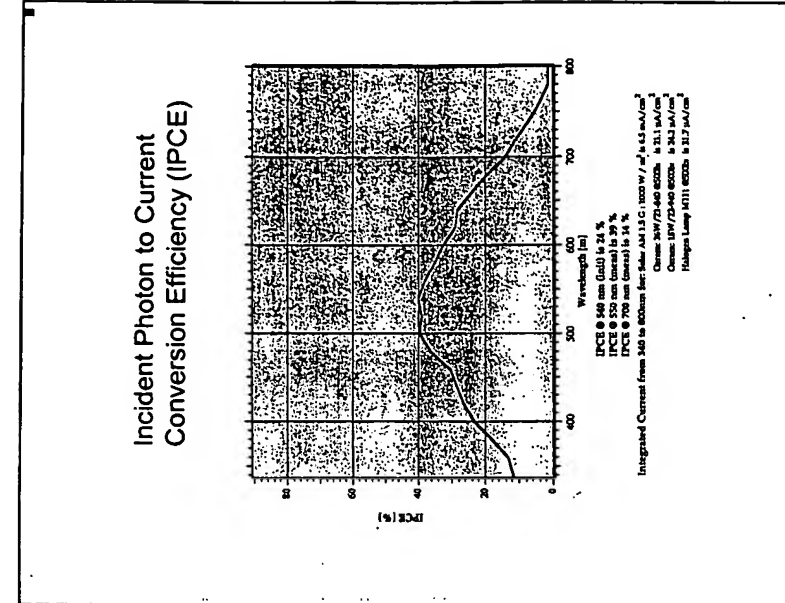


Fig. 11a: Photodegradation of 4-CP on nanoanatase with barium titanate surface layer, showing degradation of 4-CP and formation of intermediate degradation products

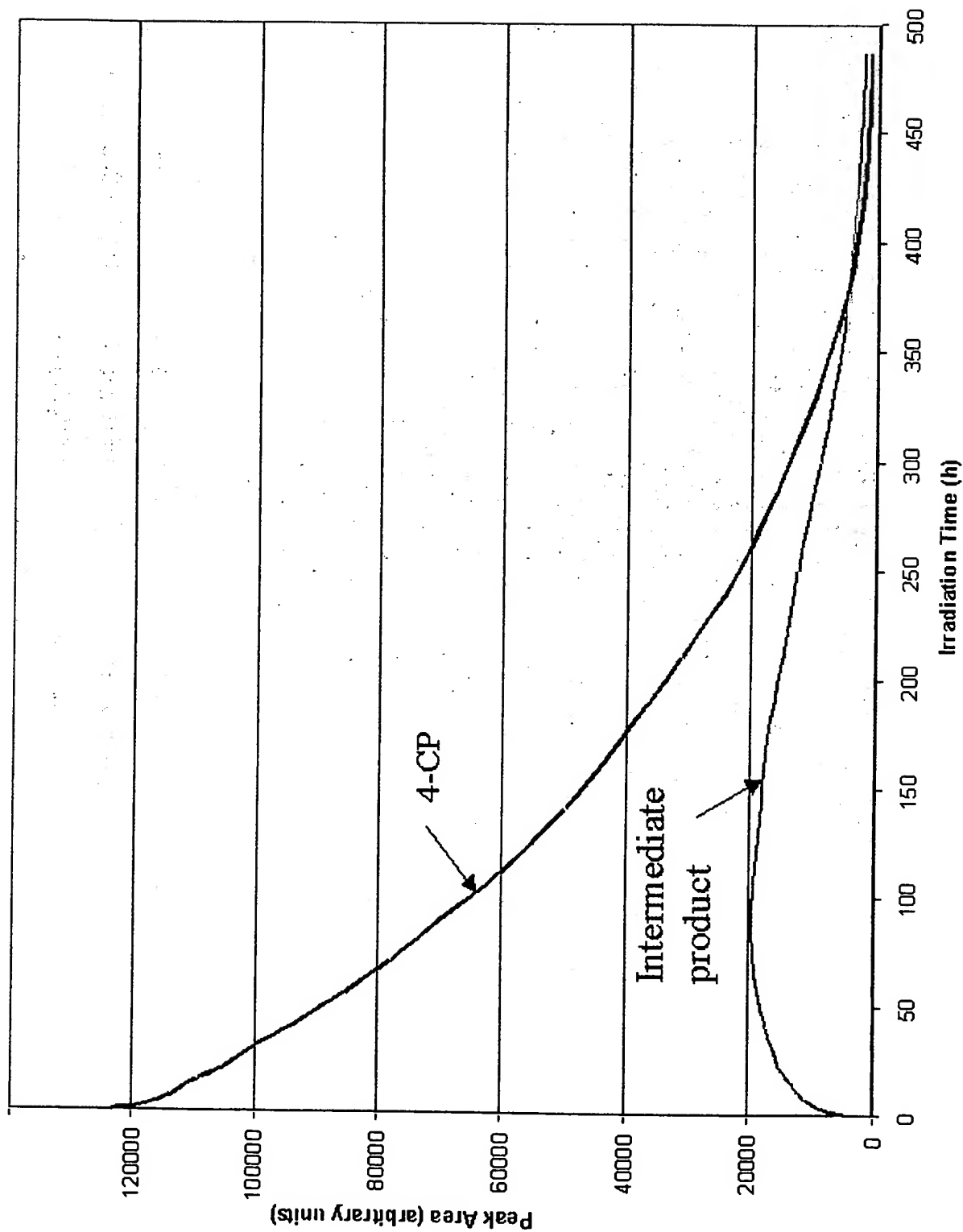


Fig. 11b: Photodegradation of 4-CP on nanoanatase base material, showing degradation of 4-CP and formation of intermediate degradation products

